

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9611

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION 2011-12

ENGINEERING PHYSICS—II

Time : 2 Hours

Total Marks : 50

SECTION—A

1. Attempt *all* parts. All parts carry **equal** marks. Write answer of each part in **short** :— (5×2=10)
- (a) Compare the wavelength of a photon and an electron if the two have the same momentum.
 - (b) What are the outcomes of Laue's X-ray diffraction experiment ?
 - (c) Define Curie temperature for a ferroelectric material.
 - (d) What happens to an electromagnetic wave when it enters a conducting medium ?
 - (e) Write the name of different types of single walled Nanotube.

SECTION—B

2. Attempt any *three* parts. All parts carry equal marks. (3×5=15)
- (a) Calculate the kinetic energy needed by an electron to be confined in hydrogen atom of radius 0.5 Å.

- (b) A beam of γ -radiation having photon energy 510 keV is incident on a foil of aluminum. Calculate the wavelength of the radiation at 90° and also the kinetic energy of the emission of the corresponding electron.
- (c) Find the polarization P in a homogeneous and isotropic dielectric material of relative permeability 4, when the electric displacement density $D = 2 \times 10^{-8} \text{ C/m}^2$.
- (d) A 100 Watt sodium lamp radiating its power. Calculate the electric field and magnetic field strength at a distance of 5 m from the lamp.
- (e) A superconductor material has critical temperature of 4.2 K in zero magnetic field and a critical field of 0.0306 T at 0 K. Find the critical field at 2.1 K.

SECTION—C

Note :— Attempt *all* questions of this Section. All questions carry equal marks.

- 3. Attempt any *one* part of the following :— (1×5=5)
 - (a) Derive an expression for de-Broglie wavelength of helium atom having energy at temperature T K.
 - (b) Deduce a relation between phase velocity and group velocity. What happens if the phase velocity is independent of frequency ?
- 4. Attempt any *one* part of the following :— (1×5=5)
 - (a) Derive time independent Schrödinger wave equation for a particle wave. What happens to equation if particle is free ?
 - (b) What is Compton Shift ? Why Compton Shift is not observed with visible light ?

- 5. Attempt any *one* part of the following :— (1×5=5)
 - (a) Explain the behaviour of dielectric in an alternating field. What is relaxation time ?
 - (b) What are ultrasonic waves ? Explain piezoelectric method to produce ultrasonic waves.
- 6. Attempt any *one* part of the following :— (1×5=5)
 - (a) What do you understand by displacement current ? Why and how Maxwell modified Ampere's law ?
 - (b) What is Poynting vector ? Write down Poynting theorem and explain its physical significance.
- 7. Attempt any *one* part of the following :— (1×5=5)
 - (a) What are superconductors ? Describe Meissner effect in superconductors.
 - (b) What is nanotechnology ? Give some important applications of nanotechnology.

Physical constants :

Speed of light	$c = 3.0 \times 10^8 \text{ m/s}$
Planck's constant	$h = 6.62 \times 10^{-34} \text{ J-s}$
Mass of electron	$m = 9.1 \times 10^{-31} \text{ kg}$
Permeability	$\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$
Permittivity	$\epsilon_0 = 8.854 \times 10^{-12} \text{ F/M}$